

Different gaps and bands in Thue-Morse photonic quasi-crystals

Xunya Jiang^{1,2}, K.C. Huang², Huaping Lei¹ and J. D. Joannopoulos²

¹State Key Laboratory of Functional Materials for Informatics, Shanghai
Institute of Microsystem and Information Technology, Chinese Academy of
Sciences, 865 Changning Road, 200050, Shanghai, China

²Department of Physics, Massachusetts Institute of Technology Cambridge,
Massachusetts 02139 USA

Photonic band-gap (PBG) can occur not only in the periodic systems, but also in the systems with other spatial correlations. In 1D Thue-Morse dielectric structures, we find two kinds of PBG, traditional gap and fractal gap, which behave quite different in the spectra. And we reveal the physical reason for the gaps, two kinds of the spatial correlation in the Thue-Morse structure. We also studied the localization properties of the eigen-states near these gaps, the states traditional gaps are more like common Bloch states while the states near the fractal gaps have the quasi-localized form. The states can be used in the design of novel optical/photonic cavities.